

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

A Protective Device for Reducing the Effect of Projectiles with Bursting Charges

We, AKTIEBOLAGET BOFORS, a Swedish company, of Bofors, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a device for affording protection to objects such as combat vehicles, naval vessels and fortifications against projectiles with a bursting effect, primarily hollow-charge projectiles.

The penetratability of hollow-charge projectiles is usually far greater than that obtained with other kinds of projectiles of corresponding sizes. The only hitherto known method of achieving protection against hollow-charge projectiles with reasonable weight and cost has been to arrange screens made of thin armour plate outside an object dimensioned for protection against other kinds of armour - piercing projectiles. These screens have caused a projectile with a hollow charge to burst so far from the main protection that its bursting cone has been weakened to such an extent before impact that it has not been capable of piercing this protection. However, such screens have certain disadvantages and thus they have only been used to a minor extent. Only small portions of the object can be protected by the screens, due to the fact that it is necessary to place these at comparatively long distances, 1—2m, from the object if the protective effect is to be sufficient. At these long distances, plate screens, covering a large portion of the object, would to too great an extent limit the field of vision of the crew, the zone covered by the weapon and the mobility of the object itself. Another disadvantage of these plate screens is that they must absorb very great forces in relation to their strength when they are hit by shock waves of projectiles bursting in their vicinity, and can thus easily be torn off the object they are intended to protect.

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The object of the present invention is to avoid the said disadvantages. The invention, which is especially adapted to armoured objects such as combat vehicles, naval vessels and gun turrets in fortifications, consists of a screen spaced from the object to be protected, characterized in that it consists of a number of parallel heavy bars, preferably made of a strong metal alloy, which are made to form a grating by means of a few connecting members. The distance between the bars is appropriately approximately equal to the caliber of the smallest projectiles against which the screen is to afford protection, so that a projectile, when the point of the projectile passes between the bars, will strike one of these with a part of the wall of the projectile. The bars are dimensioned so that at impact damage will be caused to the bursting charges in such projectiles.

For a protective grating intended primarily for tanks, this involves a spacing of the bars of approximately 7cm and a cross-section of the bars of at least 1cm².

By making the screens in the form of gratings it is possible to arrange them so that the field of vision of the crew of the armoured object is not impaired to any significant degree. With consideration to this the maximum width of the bars in the plane of the grating should not exceed the normal eye spacing, i.e. approximately 5cm. Furthermore, these screens will have but little sensitivity to shock waves from bursting projectiles.

Projectiles with hollow charges are very sensitive to damage to the bursting charge. Even small cracks can cause a considerable reduction in their effect. If there is major damage, the effect will be eliminated entirely. By choosing a correct distance between the bars of the grating and the dimensions of the bars the grating will cause damage to the projectiles and the bursting charges in a considerable number of cases before the burst takes place, as it is highly probable that the point

of the projectile will not strike any grating bar. The armour-pierceability of present-day projectiles with hollow charges will then be nearly entirely eliminated, as these projectiles have very thin walls. Even if the point of a projectile in a small number of cases should strike a grating bar, the armour-pierceability will be reduced because of the distance from the main armour. Furthermore, the bursting cone will be disturbed by the grating bar which is in its way.

Due to their capability in many cases of partly or entirely eliminating the hollow charge effect, screens according to the invention also involve an essential reinforcement of the armour protection when placed at much shorter distances from the main armour than required for plate screens. It may therefore be appropriate in regard to armour surfaces where the screens have a disturbing effect on the freedom of movement of the armoured object to arrange the screens so that they are movable and so that they are normally placed in a comparatively short distance from the main armour, in a position which only to a slight extent limits the freedom of movement but still affords a certain degree of protection, but can be moved out to a greater distance where they give more complete protection when combat is expected.

As an example of the invention there is shown in Figure 1 of the accompanying drawing a side view of a combat vehicle with the front armour reinforced with a screen 1 according to the invention placed in the combat position. The screen is supported on two beams 2 arranged along each side of the vehicle. As the beams are supported on rollers 3 the screen can be moved in the longitudinal direction of the vehicle between the front position 1, primarily intended for combat, and a retracted position 4, suitable for travelling and other occasions when a protruding screen would limit the freedom of movement of the vehicle.

Figures 2 and 3 each show an example of the cross-section of a screen as taken along the line I—I in Figure 1. In both examples the dimension "d" is approximately equal to the caliber of the smallest projectiles against which the screen is intended to afford protection. According to Figure 2 the bars have a circular cross-section, which is advantageous from the point of view of manufacture. According to Figure 3 the bars have an approximately triangular cross-section, which involves somewhat higher manufacturing costs than those according to Figure 2, but gives better possibilities of causing damage to the bursting

charges of projectiles which hit the screen from a direction approximately at right angles to the plane of the screen, i.e. a direction in which the projectile gives the maximum armour-piercing effect.

The bars in a protective device according to the invention can be placed in any arbitrary direction. However, where consideration should be given to the field of vision, it is appropriate to have them placed at right angles to a horizontal line. The members which hold the bars together to form a grating should be as few as possible, so that they offer the least possible impact surface for the points of the projectiles.

In addition to being a protection against hollow charge projectiles the device of the invention can also be used as a protection against the bursting effect of other kinds of projectiles, e.g. "squash-head" shells and ordinary high-explosive shells, as the detonation point will be at a distance from the main armour.

WHAT WE CLAIM IS:—

1. A protective device for reducing the effect of projectiles with bursting charges, consisting of a screen spaced from the object to be protected, characterized in that it consists of a number of parallel heavy bars, preferably made of a strong metal alloy, which are made to form a grating by means of a few connecting members.
2. A device according to Claim 1, wherein the grating screen is constructed with a distance between the bars approximately equal to the caliber of the smallest projectiles against which the screen is to afford protection.
3. A device according to Claim 1 or Claim 2, wherein the bars have a cross-section of at least 1cm² and a width in the plane of the grating not exceeding 5cm.
4. A device according to any of Claims 1 to 3, wherein the screen is movable between two positions, an extended combat position and a retracted position.
5. A device according to any of Claims 1 to 4, wherein the grating bars have a cross-section tapering in the direction away from the object to be protected, preferably to a point.
6. A protective device as claimed in Claim 1, substantially as hereinbefore described and as shown in Figures 1 and 2 or in Figures 1 and 3.

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1 SHEET

COMPLETE SPECIFICATION

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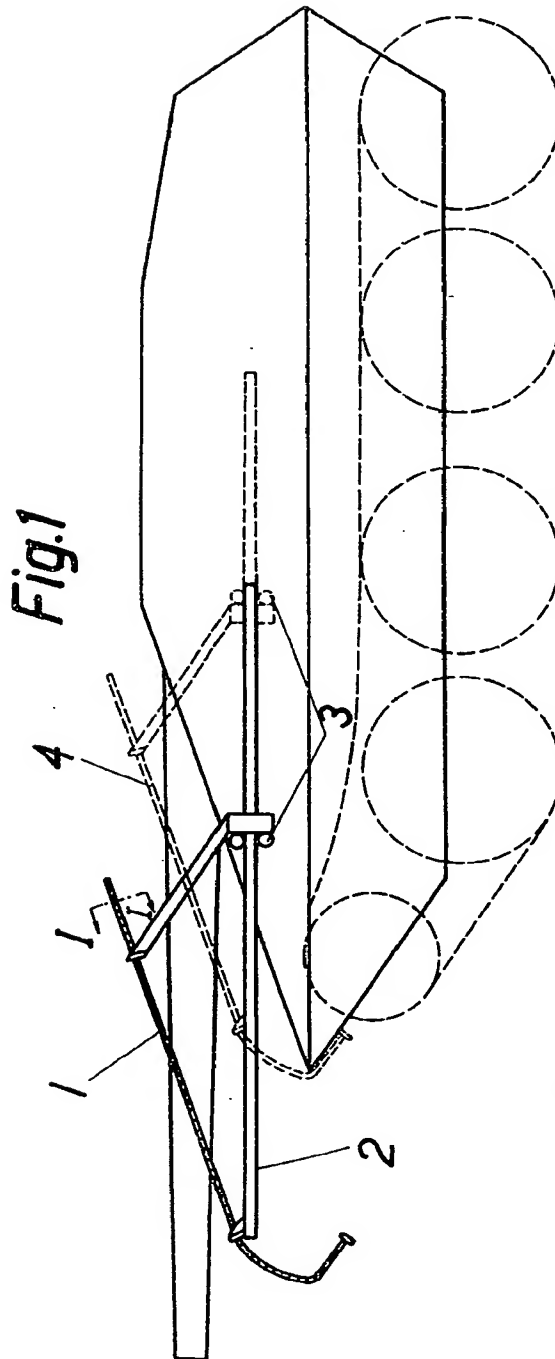


Fig. 3

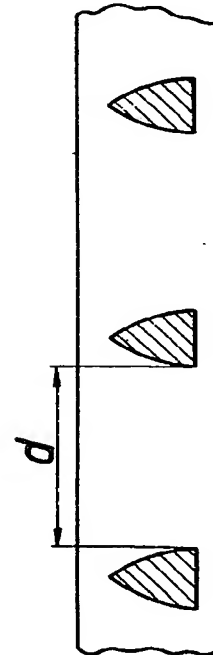
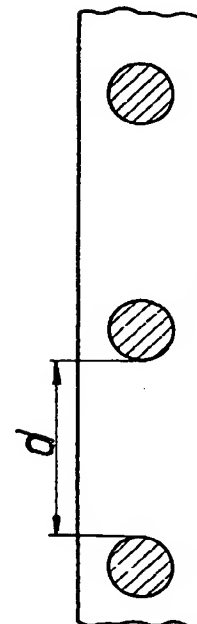


Fig. 2



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